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ABSTRACT

The question of how to use technology effectively in the assessment of teacher candidates to demonstrate achievement of course objectives based on state certification standards led to the development of the electronic portfolio project at a small university teacher credential program. The process of preparing an electronic portfolio using computer and multimedia technology was examined from the perspective of 12 teacher candidates enrolled in a multiple subject reading methods class. This research was a multiple case study in which qualitative data were obtained through open-ended interviews with the teacher candidates, the course professor, and the computer lab technician, as well as through analysis of the electronic portfolio product. Whether the electronic portfolio could be considered an effective tool for documenting teacher candidate performance and the achievement of course objectives was the primary question investigated in this study. (Contains 25 references.) (Author/SM)

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Electronic Portfolios in Teacher Education Reading Methods Courses

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Abstract: The question of how to use technology effectively in the assessment of teacher candidates to demonstrate achievement of course objectives based on state certification standards led to the development of the electronic portfolio project in a small university teacher credential program. The process of preparing an electronic portfolio using computer and multimedia technology was examined from the perspective of twelve teacher candidates enrolled in a multiple subject reading methods classes. This research was a multiple case study in which qualitative data was obtained through open-ended interviews with the teacher candidates, the course professor, and the computer lab technician, as well as through analysis of the electronic portfolio product. Whether the electronic portfolio could be considered an effective tool for documenting teacher candidate performance and the achievement of course objectives was the primary question investigated in this study.

Preparing teachers for the 21st Century has been a concern for both political and educational leaders in this country during the last two decades. Public education reform was triggered a decade earlier by a report, A Nation at Risk, which claimed that U.S. students generally achieved at lower skill levels than those of other industrialized nations (National Commission on Excellence in Education, 1983). The Goals 2000: Educate America Act enacted by Congress in 1994, provided the framework for education reform for the 21st Century. This legislation called for the establishment of high-quality, internationally competitive content and performance standards for all students, promoted the use of technology to enable all students to achieve national goals, and emphasized the need for teacher education and professional development. Teachers were to be given the opportunity to acquire the knowledge and skills needed to instruct and prepare students for the next century. They were to have access to programs to improve professional skills and encouraged "to use emerging new methods, forms of assessment, and technologies" (The National Education Goals Panel, 1998).

The National Council for Accreditation of Teacher Education (NCATE) issued a report called "Technology and the New Professional Teacher: Preparing for the 21st Century Classroom" in 1997. The NCATE Task Force on Technology and Teacher Education recommended that NCATE stimulate more effective uses of technology in teacher education programs. NCATE challenged higher education to incorporate technology across the entire teacher education program, not just as a "computer literacy" class added to the existing curriculum. The NCATE Task Force stated that teacher education is in a time of transition, calling for experimentation and a new attitude that is "fearless in the use of technology." NCATE recommended that teacher education programs provide early experiences for their students and that technology be integrated into other education reform efforts. This study focused on the use of technology as a tool for performance assessment of teacher candidates who were enrolled in reading methods courses.

Three themes of significance for this study converged in recent education reform documents concerning the preparation of teachers for the 21st Century: teacher accountability to professional content and certification standards, performance-based authentic assessment for both teachers and students, and the need for educators to have technological expertise. The U.S. Department of Education's New Teacher's Guide stated: "The highest academic standards, the best facilities, the strongest accountability measures, and the latest technology will do little good if we do not have a teaching force of the highest quality" (1997, p. 1). Providing well-prepared, technologically literate teachers who meet high professional standards has presented a challenge to pre-service teacher training institutions.

Standards

The U.S. Department of Education Strategic Plan, 1998-2002 called for a talented and dedicated

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teacher in every classroom and recommended that each state align licensing and certification requirements with challenging content standards and performance-based assessments (U.S. Department of Education, 1997). The strategic plan supported the National Board for Professional Teaching Standards (NBPTS) and "programs that reward good teachers and address the problems of incompetent ones" (1997, p. 7). The NBPTS has been developing advanced standards for teacher in more than 30 certification fields. The certification process was to be performance based, requiring new assessment procedures and strategies. Teachers were to apply for national board certification by demonstrating their professional skills, knowledge and accomplishments through a two-part assessment process.

The NBPTS certification process required that the teacher take responsibility for managing and monitoring student learning, using a variety of evaluation methods to track student progress. Their knowledge extended to creating innovative tools for evaluation, including portfolios, videotapes, demonstrations and exhibitions. NBPTS required that teachers think systematically about their practice and learn from experience. Accomplished teachers "have the ability to reason and take multiple perspectives, to be creative and take risks, and to adopt an experimental and problem-solving orientation" (NBPTS, 1998).

In the first phase of NBPTS assessment, teachers were to build a portfolio to show evidence of good teaching practice and to demonstrate how their teaching meets the advanced standards. Portfolios included artifacts, videotapes, examples of student work, and reflections relating to the selected teaching and learning sequence and the role of on going teacher assessment. The second component of the assessment involved a full day of written tasks and assessment exercises to be completed at an assessment center. Candidates for National Board Certification spend approximately 120 hours on assessment activities over the course of a school year.

The National Council for Accreditation of Teacher Education (NCATE) revised standards for schools of education in 1995. NCATE called for rigorous standards closely aligned with core academic and skill standards for students. National funding for supporting the strengthening of state licensure standards for beginning teachers was a part of the broader goal of helping all students master the basics and reach high academic standards (IASA, 1997). States vary in how they license classroom teachers, but more than 30 states have been working on the development of high-quality performance assessments of knowledge and skills for new teachers.

The Goals 2000: Educate America Act encouraged states to coordinate their own standards reform efforts and provided funds to states and school districts for better teacher training and professional development. In California, the Challenge School District Reform initiative called for fundamental changes needed to move to a high-performance, standards-based system of public instruction for all students (California Department of Education, 1998). The California Commission on Teacher Credentialing (CTC) began to redesign their program approval and evaluation process for teachers and published standards of quality for all state credential programs (1993). The California Standards for the Teaching Profession (CTC, 1997) presented updated standards for professional teaching practice. The Advisory Task Force on Teacher Preparation for Reading Instruction established additional literacy standards and factors to be considered in September of 1997.

Assessment

Roeber (1995) stated that new content standards require different assessment methods. Researchers indicated that educators have been looking for assessments that promote the type of instruction encouraged by new content standards (IASA, 1996a). The Office of Educational Research and Improvement (OERI) said that performance assessments were to augment or replace norm-referenced multiple-choice tests on all educational levels (1993b). Performance assessment was described as testing students through the performance of tasks rather than to selecting answers from a ready-made list. Performance assessment methods that have been used successfully included open-ended or extended response exercises that require an oral or written response, extended tasks carried out over a long period of time, and portfolios which may include works in progress, as well as final products (OERI, 1993b).

The ERIC Digest Series included numerous electronic documents on the general topic of alternative assessment, sometimes called authentic assessment, performance-based assessment, portfolio assessment, direct assessment, or developmentally appropriate assessment. Bowers (1989) discussed the problems of standardized testing which brought about the trend toward new alternatives in assessment. He stated that many school districts have adopted a "test-driven curriculum" and have been "teaching to the test." He

supported a criterion-referenced approach that would reflect mastery of skills being tested, rather than a norm-referenced approach. Sweet and Zimmerman (1992) presented methods that have been used successfully to assess performance. Because performance assessments require students to actively demonstrate what they know, these authors felt that performance assessment may be a more valid indicator of students' knowledge and abilities.

Grace (1992) promoted the portfolio as realistic, instructionally, and developmentally appropriate assessment. The portfolio was an appropriate evaluation when it compared the student's current work to his or her earlier work. The portfolio was not to be used for comparing students to each other. Instead, the evaluation indicated the student's progression toward a standard of performance that was consistent with the curriculum and appropriate developmental expectations. Portfolios supported instruction by informing students of the criteria of quality performance so they could monitor their own learning, engage in activities that result in products to be shared with others, and provide a channel of communication between students and teachers focused on student work (OERI, 1993a). For administrative purposes, portfolios were being used for accountability reporting and program evaluation. The questions concerning the value of portfolios for administrative decision making related to technical adequacy, comprehensiveness, validity, reliability, and generalizability to other curriculum areas.

According to an Improving America's Schools Act newsletter (IASA, 1996b) on issues of school reform, the success of portfolio assessment has not been determined. Research on classroom instruction in two states using portfolio assessment, Kentucky and Vermont, indicated that "teachers spend more time training students to think critically and solve complex problems that they did previously" (IASA, 1996a, p. 1). The Arizona Student Assessment Program reported little instructional change in most schools due to lack of state support for teachers trying to change their teaching strategies (IASA, 1996a). Research on the Arizona program demonstrated that alternative assessment has not been effective in closing the gap between white and minority students. Remedial and lower track classes included a larger proportion of racial and ethnic minorities due to lower standardized test scores. As a result, more classroom time was spent on test preparation and learning basic skills rather than on higher-order thinking skills addressed with higher performing students. Attempts were being made at establishing greater equity by providing every student with the support and resources that were needed to master higher level content. An additional complication with alternative assessment was the higher cost of performance-based assessments in comparison to the multiple-choice tests that could be scored electronically. (IASA, 1996a)

The 1998 winter issue of Teacher Education Quarterly featured studies on the use of portfolios in teacher education programs. In the editor's preface, Jones (1998) stated that "portfolios have assumed a significant role in teacher education" (p. 3). In California, the development of teaching portfolios grew out of the discussions of a Special Interest Group (SIG) of the California Council on the Education of Teachers (CCET). This group met to discuss how to structure portfolios and determine whether a teacher's portfolio could be used to assess teacher performance. Bartell, Kaye, and Morin (1998a) explained that portfolios were valuable to students for promoting reflection and self-directed growth, building good teaching habits, encouraging collaborative dialogue and enriched discussions, documenting growth over time, and "integrating the diversity of their teacher preparation experiences" (p. 6).

Wolf (1996) described a teaching portfolio as a "collection of information about a teacher's practice" (p. 86). He stated that the collection should be more than a scrapbook of miscellaneous artifacts and lists of professional activities. The introductory section should include the student's teaching philosophy and goals. The concluding section should include ongoing professional development and formal evaluations. At the heart of the portfolio, however, should be a combination of teaching artifacts and written reflections. He emphasized that artifacts should be framed with clear identifications, contextual explanations, and reflective commentaries that examine the teaching documented in the portfolio. These reflections should go beyond describing the contents and focus on what the teacher and students learned (p. 88). Wolf suggested that students include an informal or formal self-assessment of the portfolio. He stated that a formal assessment should be tied to specific criteria or performance standards such as those provided by the National Board for Professional Teaching Standards (NBPTS).

Professional standards for teachers have been developed at both the national and state levels as a means of determining what a teacher should know and be able to do when they complete a teacher preparation program. The California Commission on Teacher Credentialing (CTC) required that each teaching candidate demonstrate meeting standards through documentation and written verification (Bartell, Kaye, & Morin, 1998,

p. 130). Bartell, Kaye, and Morin believed that portfolio documentation was an effective way for teacher candidates to present artifacts and evidence demonstrating the meeting of standards. The portfolio was considered a "vehicle for both formative and summative assessment by self and others" (p. 131). Portfolios provided a means of "elevating the dialogue about teaching practice" (p. 131).

Bartell, Kaye, and Morin (1998) reported research on an introduction to teaching course offered by the Division of Curriculum and Instruction faculty at California State University, Los Angeles (CSULA). This course introduced all education students to the format, purpose, and use of teacher constructed portfolios. As students progressed through each course in the program, they were asked to produce evidence that they were meeting CTC and NCATE standards. Students wrote a reflection page for each piece of evidence, discussing the purpose and the effectiveness of each artifact. Faculty members at CSULA generally viewed portfolios as valuable in helping students make connections between coursework and student teaching experiences. Faculty members were working at improving the way in which students could show evidence of teaching competencies. They agreed that each professor should support students in specific course content and requirements and provide additional portfolio checkpoints and advisement during student teaching. Informational seminars were held for faculty and adjunct student teaching supervisors in order to share practices and guide students in the portfolio process (p. 134).

An actual examination of evidence, artifacts of teaching, and conversations between prospective teachers and mentors provided the research base for the California standards (Bartell, Kaye, & Morin, 1998, p. 136). The "Standard for Engaging and Supporting All Students in Learning" called for student to engage in problem solving, critical thinking, and activities that made subject matter meaningful. Teacher candidates were asked to answer, "How do I..." or "Why do I...." Portfolio evidence to be gathered, examined, and reflected upon could include student work, student assessment, description of teaching strategies used, mentor observations, and personal reflections (Bartell, Kaye, & Morin, 1998, p. 137). Bartell, Kaye, and Morin (1998b) explained that the practice of linking professional standards with practice as a means of improving discussion, examination, and documentation has been largely unexplored (p. 137). They believed that portfolios could provide a basis for strengthening mentoring dialogue at each stage of a prospective teacher's development (p. 138).

Anderson and DeMeulle (1998) surveyed 127 teacher educators throughout the United States to examine portfolio practices in teacher preparation programs. Findings indicated that specific purposes included promoting student learning and development (96 %), encouraging student self-assessment and reflection (92%), providing evidence for assessment and accountability (88%), and documenting growth of pre-service teachers (88%). Ninety-two percent stated that portfolios had a positive impact on preservice teachers because portfolios were student-centered, defined by professional standards, and reflective (pp. 26-27). Portfolios were viewed as "self-empowering tools that encourage preservice teachers to assume more responsibility for their learning" (p. 26). Anderson and DeMeulle (1998) reported that faculty respondents demonstrated a growing interest in the use of state and national professional standards as a part of portfolio development (p. 27). Portfolios were reported as having a positive impact on teacher education programs as indicated by increased collaboration and collegiality among faculty and agreement about program outcomes (p. 28).

Technology

Bennett and Hawkins (1993) discussed the use of technology as having "unique capabilities that would make crucial contributions to the creation of workable and meaningful forms of alternative assessment." They stated that computers and video records offered potential for collecting and storing records of students' work. Lankes (1995) discussed the use of computer technology as a "likely solution" to the problem of creating, managing, and storing portfolios. Electronic or computer-based portfolios were considered similar to traditional paper portfolios, but information was collected, stored, and managed electronically with computerized text, graphics, sound, and video. Lankes stated that computer-based portfolios provided authentic demonstrations of accomplishments and motivated students to take responsibility for their own work.

The International Society for Technology in Education (ISTE) prepared a report for The Road Ahead (1995-1997), a program of the National Foundation for the Improvement of Education (NFIE). Technology was described as providing new assessment tools, including computer-based self-scoring tests, electronic gradebooks, and computer-based student portfolios. Multimedia databases provided a more compact, storable, and retrievable tool for student portfolios (pp. 7-8). ISTE reported that information technologies added "new

dimensions to portfolio assessment" (p. 17). Computer editing could facilitate the arrangement of the portfolio items, allowing for one presentation to be used for a variety of purposes. Evidence in the form of pictures, graphics, sound, and text could be digitized and stored. ISTE recommended the use of interactive multimedia stacks and Web pages to develop portfolio products. Science simulations, synthesized music, and complex mathematical software could be demonstrated through an interactive computer program. Physical products could be edited, stored, and moved to another computer or copied from one software program to another (p. 17). ISTE stated that information technologies are becoming more important in schools. The use of technology would allow students to take on authentic projects that are "more real-world in nature" (p. 18).

Sheingold and Frederiksen stated that technology could provide "the media through which students and teachers can have conversations that lead to shared understandings of the values and standards for student performance" (Cited in Means, 1994, p. 112). Technology could help link assessment with reform by providing the following functions: support for student work in extended, authentic learning activities; portable, accessible and replayable copies of performances in multiple media; libraries of examples and interpretive tools; greater participation in the assessment process; and publication of works recognizing student accomplishments (p. 121). Technology could provide evidence of assessment beyond products that are text-based or activities that require the physical presence of the evaluator. Student work could be captured and preserved using interactive multimedia formats that integrate many forms of information on one computer disk (p. 122).

Technology could ultimately eliminate the need for physically transporting bulky paper portfolios, however Sheingold and Frederiksen emphasized that these performances must be "easily accessible to all parties" (p. 122). Schools must have appropriate recording technologies that are accessible and understandable to all potential users and group viewing systems that allow for the social activity of interpreting performances. Through technology, different evaluators would not have to rely on varied recollections long after the actual performance. They could observe an assessment activity repeatedly and focus on interpretation. The issue of ownership of the work produced by students would be solved by computer and video technologies because more than one copy of the work could exist. The collaborative group approach to evaluation was recommended as a means of interpreting and scoring performances, but an exemplar library of positive and negative examples and rationales should be included to guide assessment (p. 126).

Two of the twelve articles in the 1998 Teacher Education Quarterly issue devoted to the use of portfolios in teacher education discussed research on the use of electronic or digital portfolios. Georgi and Crow (1998) discussed the problems with traditional paper portfolios of storage, maintenance, access, ownership, and transportation. They noted problems with losing or misplacing items, indexing items, hauling bulky projects around, and retrieving certain types of exhibitions for display. They stated that "the advent of multimedia, telecommunications tools, and electronic storage media can serve educators at all levels in the design and implementation of digital portfolios" (p. 77). Georgi and Crow recommended that teacher educators help students identify instructional and assessment techniques and "seek ways to have technology strengthen these successful experiences" (p. 82).

McKinney (1998) stated that the shared potential of hypermedia technology and portfolio self-assessment presented a challenge for teachers due to lack of time, little support, and limited and always changing resources (p. 86). Schools of education were responsible for providing teacher candidates with the opportunity to participate in technology-rich environments (p. 86). McKinney conducted a study of five students to examine the effect of incorporating technology into the process of portfolio development. Students prepared two different portfolios at progressive stages of their teacher preparation program. Multiple methods of research included portfolio analysis, survey, questionnaire, and focus group interviews.

Portfolios were examined using the following categories: organization, evidence of integration, evidence of reflection, evidence of growth in content knowledge from individual courses, evidence of focus on the individual child, and changes between the first and second portfolio (p. 89). The researcher reviewed all five portfolios and two outside reviewers independently evaluated three of the five. A survey was conducted to determine familiarity with computer usage. The informant questionnaire included: questions on the importance of self-assessment in portfolios, the effects of technology on the process of developing portfolios, personal views about inclusion of technology over time and with experience, necessary support structures needed for developing electronic portfolios, impediments of the technological portfolio process, and the potential future of portfolios in teacher preparation programs (p. 90). The focus group interview was audio-

taped and transcribed for analysis.

The findings from portfolio analysis indicated that each student organized information in personally unique ways. Second portfolios included more reflective commentary with fewer artifacts and demonstrated "evidence of growth of confidence in their ability to help children learn" (p. 93). With experience, students expressed greater confidence in their technological expertise and understanding of the purposes of portfolios. A positive result of using technology in developing the portfolio process included the use of more effective ways of being able to show connections through the "nonlinear nature of multimedia software" (p. 93). Students indicated a positive attitude toward the potential of using multimedia portfolios and projects in their teaching and confidence in their ability to teach using computers. Limitations focused on lack of storage space associated with the computer hardware and software. Students indicated that they needed more computer time and greater access to the scanner, recorder, and camera. McKinney indicated that there was a need for more longitudinal research to determine the effectiveness of electronic portfolios, but that it appeared there was "value in scaffolding the development of portfolios over time" (p. 101).

The Electronic Portfolio Project

Continued research on the potential for using electronic portfolios in teacher education was carried out in a small university teacher preparation program. The electronic portfolio project was developed to explore the possibilities of using computer technology to store artifacts as evidence of achievement of course objectives. The electronic portfolio project was the final assessment for multiple subjects credential candidates enrolled in reading methodology classes during two consecutive semesters. The portfolio provided an electronic framework for documenting the meeting of course criteria, as well as evidence of self-reflection and self-assessment. A portfolio template was designed around specific course objectives based on state standards. Students included artifacts created with computer text, graphics, sound, or video as evidence of meeting each course objective. Students provided a reflective cover sheet in which they defended their selections for each objective. The text of the reflective cover sheets was examined to gain insight into the student's perceptions.

The course syllabus, designed with emphasis on learning objectives based on current state certification standards, was prepared by the course professor prior to the electronic portfolio project. Two successive groups of teacher candidates were involved in the electronic portfolio project: the spring group of six students (Group I) and the fall group of six students (Group II). The electronic portfolio project was constantly evolving throughout both semesters due to revisions in state credential standards and technological considerations. The course syllabus was altered for Group II due to revised state standards and the implementation of the Reading Instruction Competency Assessment (RICA). In addition, an attempt was made to solve some of the technical problems that were experienced by Group I. Students of Group II were required to attend a computer training seminar at the beginning of the semester to prepare for the electronic portfolio project.

This study was guided by the following questions:

- What effect does incorporating technology have on the development of a portfolio for teacher candidates?
- To what extent does the electronic portfolio process encourage self-assessment and reflection?
- In what ways does the electronic portfolio provide evidence of student learning and achievement in line with course objectives?
- What are the problems encountered in putting together the portfolio electronically?
- What do students perceive as the strengths and/or weaknesses of creating a portfolio electronically?
- What are the course professor's perceptions concerning the effectiveness of the electronic portfolio as a tool for assessment?

Themes and patterns that emerged from interviews, portfolio reflections, and field records were examined through Ethnograph, a qualitative data software analysis program, in order to gather information concerning the teacher candidate's experience of collecting and preserving digital artifacts to be used as evidence of demonstrating competencies. The teacher candidate's perceptions of the strengths and weaknesses, as well as the software and hardware problems encountered during the electronic portfolio process, were explored. Written reflections within the electronic portfolio framework were examined to gain insight into the

student's process of self-reflection and self-assessment. A computer literacy questionnaire was administered prior to the study in order to determine previous experience with and attitude toward technology. The researcher's process of creating templates in hypertext markup language (HTML) and Hyperstudio, a multimedia authoring software program, provided further insight into the design and implementation of the electronic portfolio project.

The results of this study were presented in an interactive multimedia format. Text, data, literature references, figures, tables, and graphic images were saved as HTML within a portfolio web. Qualitative data generated from Ethnograph, including sample screens, were linked to an interactive table of contents. A Powerpoint presentation provided the framework for linking directly to the Hyperstudio and HTML portfolios of teacher candidates. The reading methods course objectives were linked to multimedia evidence within each student portfolio. Design templates, narratives, interview questions, the computer literacy questionnaire, and other research data were linked from menu options as well. Narratives were presented in audio format, as well as through interactive text.

The paper portfolio was an established means of assessment in the teaching training courses at this university before the electronic portfolio project began. When the course professor was asked why she implemented electronic portfolios into her class, she stated:

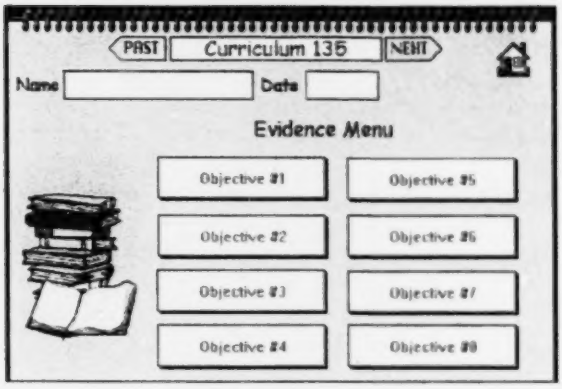
> I have worked for ten years to get faculty to infuse the use of technology into their courses and teach students to do so in productive ways--this is just another step along the way. The benefits for me? Not having to carry home 100 pounds of paper portfolios as I have been doing for several years--and seeing that students DO know how to use the technology in their classrooms when they leave--and understand not just the tech part--but the curricular uses. They have to get through the learning/uncomfortable stage before they can connect to the important parts of teaching them how to use technology in appropriate ways--and since the state does not require the computer course until 5th year--that puts all of us at a disadvantage because most do not know how to do anything but word processing and email--and now most know how to surf the net. This was my way of forcing them to learn what I wanted them to know even though I couldn't make them take the computer course.

Narratives from student interviews and portfolio reflections provided insight into the students' perceptions of the electronic portfolio process. Each individual's process varied in terms of approach to the project, the use of templates, working at home, using Hyperstudio or HTML, and the amount of time required for completing the electronic portfolio product. Technical processes varied in terms of how much technical support was needed, what technical skills were gained, and what problems were encountered. Student perceptions varied as to what they perceived as the purpose of the electronic portfolio, what attitudes they demonstrated concerning the process, how they compared electronic portfolios to paper portfolios, and how they felt concerning the use of technology in their future classrooms. Strengths and weaknesses were examined from the perspective of the participating students, as well as that of the course professor. Narratives from student interviews and portfolio cover sheets provided evidence of students' self-assessment and reflective practice. The course professor's discussion of how she evaluated students' portfolios provided further understanding of the potential for the electronic portfolio as a tool for assessment.

The process of collecting artifacts, selecting the work that best matched the course objective, determining how to get the evidence into digital format, and writing a cover sheet evaluation explaining personal achievement of each objective resulted in on-going self-assessment and self-reflection. Generally, students felt they were adequately able to present their artifacts as evidence of meeting course objectives based on standards within the electronic portfolio framework. Students demonstrated that they were guided by the course objectives throughout the electronic portfolio process and believed they were able to demonstrate achievement, competency, and proficiency in the course subject matter

The course objectives were specifically aimed at teaching reading and literacy. The artifacts included in the electronic portfolios included digitized versions of a variety of assignments from the reading methods class, as well as material from other teacher training courses. The course objectives successfully provided the students with the criteria for assessment in the electronic portfolio project. Upon the request of the course professor, Hyperstudio and HTML templates were designed to placed emphasis on the course objectives. Students provided self-reflective statements explaining the significance of the evidence they included in their portfolios. All twelve of the students in the study clearly indicated that they viewed the purpose of the electronic portfolio as a way of demonstrating that they had met the objectives.

Figure 1. Original Template in Hyperstudio



In addition to providing evidence of meeting objectives, reflective teaching was considered one of the desired effects of the electronic portfolio project. Results of this research indicated that students were engaged in self-assessment and self-reflection as they described, explained, and defended the evidence they chose to include within the electronic portfolio framework. The student comments supported the researcher's belief that, not only were course objectives considered significant to students, but that the electronic portfolio project stimulated reflective practice:

1. It was a good way for the professor to make sure we had met all of the objectives.
2. I felt that the things in the course pretty well matched the objectives.
3. I liked reflecting on what I was doing and looking back and seeing how my assignments actually matched the objectives.
4. I understand the objectives better now that I have analyzed my work.
5. To think about once we had all this information, how are we actually going to apply it and how do the goals fit with the objectives?
6. I liked having to think about how everything was related in the class because I think a lot of times teachers give you their syllabus, you read the goals and objectives, and you never think about them again.
7. The objectives--when I read them--I thought--well I think this fits and I went back and I read my stuff again and then things that I'd written sometimes gave me a clue as to whether or not I really got the material.
8. I really felt that the electronic portfolio was a great way to organize evidence and artifacts.
9. The other purpose was to show that I had met the necessary objectives for the class and that I understood that I met the objectives.
10. As with any portfolio, I was in the position to review all my work and the initial objectives of the course.
11. If you clicked on course objectives you went to a cover page that had the objective written out and you could go to the explanation page or directly to each artifact.
12. Now I can see where the objective was to make me understand how we met everything.
13. I didn't think that I had met all the objectives...but I think after sitting down and looking at all the work I had done, that I realized that I did meet those objectives.
14. I could demonstrate competency by matching artifacts with competencies. I believe I was very careful in selecting my evidence material to be certain it was adequate--and I did a good job!

One student indicated that she felt the electronic portfolio "tied the class together and gave it a sense of closure." She said, "It was nice to see the purpose and made it personal." Another student explained that the process of reflection meant "critically examining your work to determine which way you have met the selected criteria, and how you can best example or highlight your work." She had described the process of

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developing the portfolio as "a constant self-assessment." Another student said that the class helped her feel prepared. She said, "I think sticking it all in one place and making connections between the objectives and the things helped me say, oh look I am prepared. Not only do I think I am, but I can tell you why."

In terms of assessment, students generally felt that the electronic portfolio was valid and useful. One student referred to the electronic portfolio as a "viable measure of assessment." Another student remarked, "I guess they [electronic portfolios] are a good form of assessment--rather than a test." Another student expressed her preference for portfolio assessment over studying for a test. The course professor indicated that she thought students selected artifacts more carefully in the electronic portfolio because they had to "go through the mechanics of digitizing their artifacts." In her assessment, she said she examined students' choices of artifacts, the explanations regarding their choices, and indications of personal reflection upon their learning.

The emphasis on self-assessment and self-reflection was considered more significant to this study than the effectiveness of the electronic portfolio as a tool of assessment in terms of course grading or evaluation. One student said, "In doing this I was able to assess my work and reflect upon how the work I completed met these objectives." Another student stated that she got more out of the electronic portfolio and enjoyed reflecting back on what she had accomplished. Another student thought that the electronic portfolio allowed her to think about what they were supposed to be gaining from the course and the purpose for every class, lecture, and activity.

Results indicated that the primary effect of incorporating technology into the portfolio process was that students gained knowledge of computers and technical skill with software and hardware, particularly in graphics and multimedia. The total number of technical references found in interview transcriptions and within portfolio reflections provided further indication that students gained knowledge and understanding of technical processes and terminology used in computer multimedia. References to the digitizing of graphics through scanning appeared 80 times within the text of the student interviews and portfolio reflections. Eight students discussed scanning at least three times within their interviews. One student did not mention scanning, but she discussed another more complex graphic digitizing process, single frame video capture. All students participating in this study demonstrated a high level of technical understanding of the processes of digitizing their graphics. Table 1 shows the number of references to technology made by each student in interviews or within the portfolio cover sheet reflections.

Counts of References to Use of Technical Skills in Student Interviews and Portfolio Cover Sheets	#
Hyperstudio Software	89
HTML Web/Internet/E-Mail	54
Scanning/Video and Audio Capture	82
Cut/Paste/Transfer Files	50
Use of Graphics/Multimedia	36
Computer Formats and Compatibility	34
Creating Links/ Creating Interactive Buttons	27
Use of Zip Disk	20

Table 1. Counts of References to Use of Technical Skills

Most of the students were pleased with their final electronic portfolio product and were proud of their accomplishments. Students were able to personalize their portfolios, demonstrate creativity, and show their competencies electronically. Students demonstrated that they were able to self-assess and self-reflect on their learning within the electronic portfolio framework. The cover sheet reflections in which students defended their choice of artifacts placed the focus on meeting of specific course criteria. From the course professor's perceptions, the electronic portfolio project could be considered a viable means of assessment and an effective tool for self-reflection. She has continued to use the electronic portfolio in subsequent courses and indicated that students have learned to use technology successfully. Table 2 includes examples of positive student

statements.

Positive Student Comments
I was really happy with the final product.
I feel competent.
It was easy, fun, simple, and I was successful at producing my own products.
It was really proud of it.
I feel more comfortable now.
It was pretty when it was all done.
I felt pretty good about my personal section.
I had fun fooling with Photoshop.
There's always a satisfaction in seeing something get built.
I'm proud of what I prepared and I will be using it as a tool.
Hyperstudio is nice to learn because I will be able to use it in the classroom.
Hyperstudio is kid friendly.
I can apply this knowledge to other areas.
I had fun.
The artistic thing was fun. I really enjoyed the drawing part.
Really good way to show off this is what I did.
That was a blast.
You can tell I got a little silly, but it was it was fun so I didn't care.
I did a good job!
The most exciting evidence is my electronic children's book.
It is so fun and fancy done electronically.
I was happy with the way things turned out.
I feel more prepared.
Another Ah-Ha for me.

Table 2. Student Comments Reflecting Positive Attitude

The primary strength of the electronic portfolio was that students could include multimedia artifacts in the form of graphics, audio, video, animation, as well as text, providing a more complete picture of their achievement. Students regarded the aesthetic qualities and the possibilities for personal creativity as strengths of the portfolio as well. The weaknesses included the demands on students' already busy schedules, the lack of previous experience with computers, the lack of time to learn the technology required for multimedia, and the need to work within the school computer lab setting. Problems included lack of time to work on the technology, difficulty with computer lab availability, broken computer equipment, cross-platform compatibility issues with home computers, technical difficulties with hardware and software, lack of computer skills, insufficient previous experience, and the need for considerable technical support.

One of the unexpected patterns that emerged from this study was the students' pleasure in being able to express themselves creatively, artistically, and aesthetically through technology. Previous to this study, the researcher believed that multimedia technology incorporated powerful tools for creativity, particularly in performance areas that are difficult to document through the traditional verbal linguistic modes of expression typically used in academic settings. Many students expressed emotions and attitudes indicating that they enjoyed being able to use multimedia means of expression. In addition, most students believed that these creative new technologies would allow them to enhance their future classroom instruction. The course professor felt that the attitude changed as students began to see the finished product. She said that students appeared to get excited about the portfolios, particularly in terms of being able to show their individuality. She said that they demonstrated personal pride in their final product and indicated that they appeared to see "the benefits of the electronic format."

The NCATE technology task force suggested that perhaps the best way the teacher education faculty can inspire future teachers to use technology is "to cast themselves as learners and to experiment fearlessly in

the applications of technology," making themselves "role models of lifelong learning." The task force stated that re-educating the existing teaching force would require extensive professional development, but that the problem would be compounded if future teachers were inadequately prepared to use new technology. All students who participated in the electronic portfolio project indicated that they had improved their technology skills and understanding significantly through this process. This study furthered understanding of the potential for infusing technology into teacher education through electronic portfolio assessment within a non-technology reading methods course.

References

Anderson, R. S. & DeMeulle, L. (1998, Winter). Portfolio use in twenty-four teacher education programs. Teacher Education Quarterly, 25 (1), 23-31.

Bartell C. A., Kaye, C., & Morin, J. A. (1998b, Winter). Portfolio conversation: A mentored journey. Teacher Education Quarterly, 25(1), 129-139.

Bowers, B. C. (1989). Alternatives to standardized educational assessment. (ERIC Digest, ED312773).

California Commission on Teacher Credentialing (CTC). (1993, April). Standards of program quality and effectiveness, factors to consider and preconditions in the evaluation of professional teacher preparation programs for multiple and single subject credentials. Retrieved January 3, 1998 from the World Wide Web: http://www.ctc.ca.gov/profserv/programstandards/msss/msss/html

California Commission on Teacher Credentialing (CTC). (1997, January). California Standards for the Teaching Profession (CSTP). Retrieved January 3, 1998 from the World Wide Web: http://www.ctc.ca.gov/cstppublication/cstpreport.html

California Commission on Teacher Credentialing (CTC). (1998, April). Commission proposes legislation for major restructuring of teacher credentialing. Retrieved October 12, 1998 from the World Wide Web: http://www.ctc.ca.gov/sb2042.html

Georgi, D & Crow, J. (1998, Winter). Digital portfolios: A confluence of portfolio assessment and technology. Teacher Education Quarterly, 25(1), 73-84.

Improving America's Schools Act of 1994 (IASA). (1996b, Spring). Standards: What are they? Improving schools: A newsletter on issues in school reform. Retrieved September 15, 1998 from the World Wide Web: http://www.ed.gov/IASA/newsletters/standards/pt1.html

Improving America's Schools Act of 1994 (IASA). (1997, April). Improving schools: The critical role of good teachers and good teaching. Excellence and Accountability in Teaching. Retrieved August 26, 1998 from the World Wide Web: http://www.ed.gov/pubs/ExcellAcctTeach/part-1.html

International Society for Technology in Education (ISTE). (1995). National standard for technology in teacher preparation: ISTE accreditation and standards committee. Retrieved May 1, 1998 from the World Wide Web: http://www.iste.org/Resources/Projects/TechStandards/intro.html

Lankes, A. M. D. (1995, December). Electronic portfolios: A new idea in assessment. ERIC Digest. Retrieved March 16, 1998 from the World Wide Web: http://ericae.net/db/edo/ED390377

McKinney, M. (1998, Winter). Pre-service teachers' electronic portfolios: Integrating technology, self-assessment, and reflection. Teacher Education Quarterly, 25(1), 85-103.

Means, B. (Ed.). (1994). Technology and education reform: The reality behind the promise. San Francisco: Jossey-Bass.

The National Board for Professional Teaching Standards (NBPTS). (1998). The standards: What teachers should know and be able to do. Retrieved April 23, 1998 from the World Wide Web: http://www.nbpts.org/nbpts/about-nbpts.html

National Commission on Excellence in Education (1983). A nation at risk: The imperative for educational reform. Washington, D. C.: US Department of Education.

National Council for Accreditation of Teacher Education (NCATE). (1997). Technology and the new professional teacher: Preparing for the 21st century classroom. Retrieved February 13, 1997 from the World Wide Web: http://www.ncate.org/projects/tech/TECH.HTM

The National Education Goals Panel (NEGP). (1998). National education goals: Building a nation of learners. Retrieved March 13, 1998 from the World Wide Web: http://www.ed.gov/legislation/GOALS2000/TheAct/index.html and wysiwyg://101/http://www.negp.gov/WEBPG10.htm

Office of Research Education (OERI). (1993a, November). Consumer Guide: Student portfolios: Classroom uses. Retrieved March 4, 1998 from the World Wide Web: http://www.ed.gov/OR/ConsumerGuides/classuse.html

Office of Research Education (OERI). (1993b, September). Consumer guide: Performance assessment. Retrieved March 4, 1998 from the World Wide Web: http://www.ed.gov/OR/ConsumerGuides/perfasse

Roeber, Edward (1995). Emerging student assessment systems for school reform. Retrieved March 13, 1998 from the World Wide Web: http://www.ed.gov/databases/ERIC_Digests/ed389959.html

Sheingold K. & Frederiksen, J. (1994). Using technology to support innovative assessment. In B. Means (Ed.), Technology and education reform. San Francisco: Jossey-Bass.

Sweet, D & Zimmerman, J. (1992, November). Performance assessment. (ERIC Digest, ED353329).
Wolf, K. (1996, March). Developing an effective teaching portfolio. Educational Leadership, 53, 34-37.

U. S. Department of Education. (1997, September). The new teachers guide to the U.S. Department of Education. Retrieved March 23, 1998 from the World Wide Web: http://www.ed.gov/pubs/TeachersGuide/teach.html

United States of America 103rd Congress. (1994, January). Goals 2000: Educate America Act. H.R.1804. Retrieved March 13, 1998 from the World Wide Web: http://www.ed.gov/legislation/GOAL2000/TheAct/index.html

U. S. Department of Education. (1997, September). Framework of strategic plan goals and objectives, 1998-2002. Retrieved August 5, 1998 from the World Wide Web: http://www.ed.gov/pubs/StratPln/framewor.html